

REVIEW OF THE GENUS *NEOPLASTA* COQUILLET OF AMERICA
NORTH OF MEXICO (DIPTERA; EMPIDIDAE; HEMERODROMIINAE)

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Abstract.—The genus *Neoplasta* Coquillett is reviewed for America north of Mexico. A generic description and new descriptions of three previously known species, *Neoplasta hebes* Melander, *N. scapularis* (Loew), and *N. megorchis* Melander (**new status**), are presented. Nine new species are described from America north of Mexico: *Neoplasta bifida*, *N. chrysopleura*, *N. concava*, *N. deyrupi*, *N. hansonii*, *N. octoterga*, *N. parahebes*, *N. paramegorchis* and *N. scapuliformis*. A key to males, illustrations of male terminalia, known distributions, and concluding remarks on biology and systematics are included.

Key Words: Diptera, Empididae, Hemerodromiinae, *Neoplasta*, dance flies

Adult flies of the genus *Neoplasta* Coquillett are similar to other genera of Hemerodromiinae in being small (body length from 2.0 to 4.0 mm) and slender, and in possessing raptorial fore legs; also, their wings lack an anal lobe and are relatively slender. Species fitting the present concept of *Neoplasta*, described below, are restricted to the Nearctic and Neotropical Regions; Nearctic taxa of *Neoplasta* have been treated taxonomically by Melander (1902, 1928, 1947). This paper is limited to species of *Neoplasta* of America north of Mexico, and includes a generic description, descriptions of three previously described taxa and nine new species, a key to males, known distributions, and concluding remarks on biology and systematics. In addition to species of *Neoplasta* treated in this paper, 21 species are reported from the Americas south of the United States (Smith 1967), including from Mexico and Costa Rica (Melander 1947), Brazil (Smith 1962), and Patagonia and southern Chile (Collin 1933).

MATERIALS AND METHODS

The present study was facilitated by the examination of the large numbers of adults of *Neoplasta*, including many from the southwestern and western United States, added to North American collections since Melander's (1947) revision. The following institutions (acronyms following) provided material upon which this work is based: American Museum of Natural History, New York (AMNH); California Academy of Sciences, San Francisco (CAS); Canadian National Collection, Biological Resources Division, Agriculture Canada, Ottawa (CNC); Cornell University, Ithaca (CU); Florida State Collection of Arthropods, Gainesville (FSCA); James Entomological Collection, Washington State University, Pullman (WSU); Purdue University Entomological Research Collection (PERC); Snow Museum, University of Kansas, Lawrence (UKL); United States National Museum of Natural History, Washington D.C. (USNM); University of California, Riverside (UCR);

University of Minnesota, St. Paul (UMSP); University of New Hampshire, Durham (UNH); and Utah State University, Logan (USU).

The methods employed in this study, including terminology pertaining to vestiture (McAlpine 1981), interpretation of male terminalia (Cumming and Sinclair 1990), and methods of specimen preparation (Cumming 1992) and examination, follow those reported in a review of the genus *Chelipoda* Macquart (MacDonald 1993).

Genus *Neoplasta* Coquillett

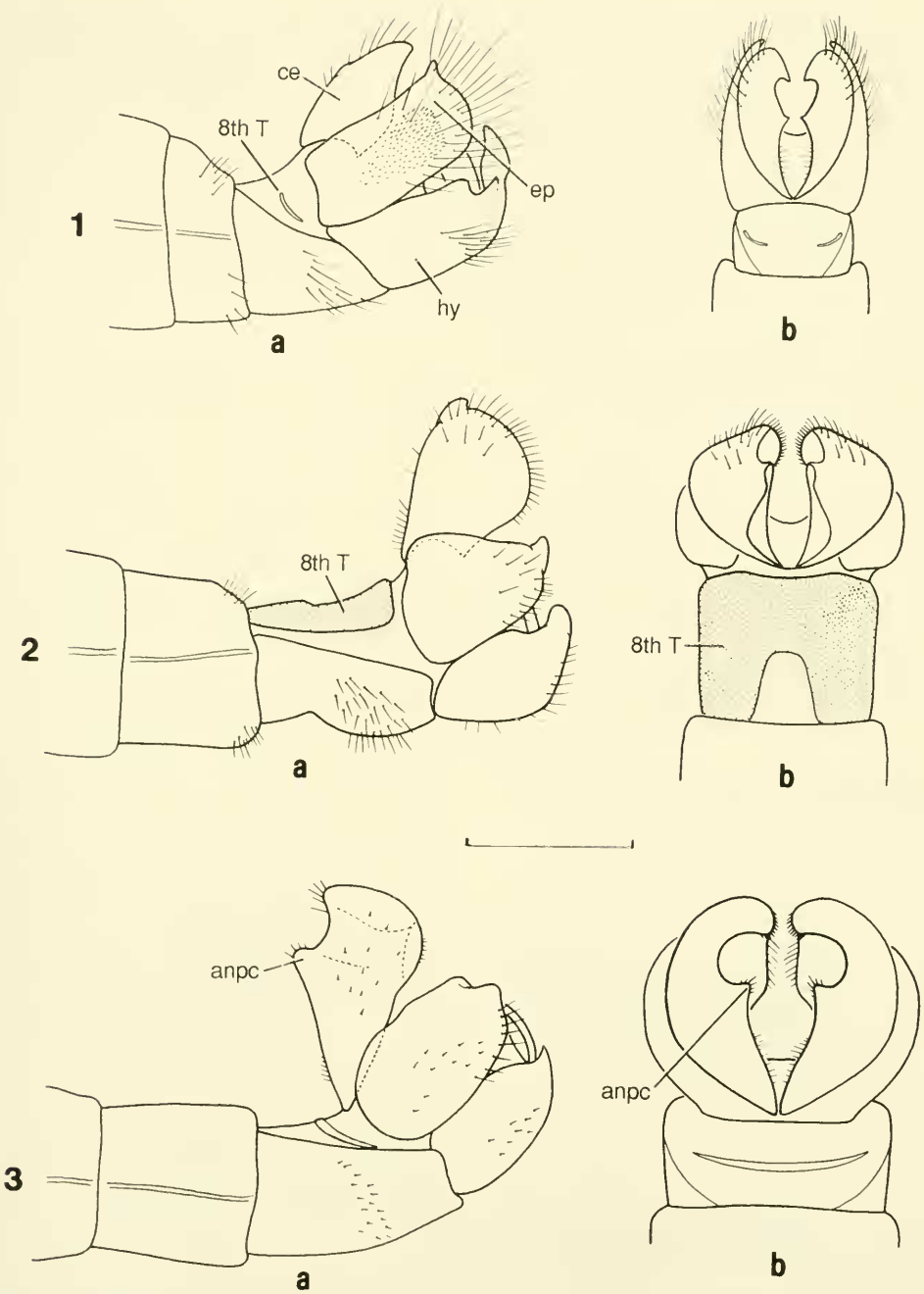
Neoplasta Coquillett, 1895: 392. Type species, *Hemerodromia scapularis* Loew (orig. des.).

Diagnosis. — Adult flies in the genus *Neoplasta* are distinguished from those of other genera of Hemerodromiinae in America north of Mexico by a combination of features. The fore femur is much less enlarged (diameter ca. 2× greater than fore tibia, compared to at least 3× greater in other genera) and is lined ventrally by only a single row of black setulae. The fore tibia lacks both black setulae along the ventral surface and a distal bristle. Crossvein bm-cu is lacking, and three separate veins, M_1 , M_2 , and CuA_1 , arise from apex of confluent cell bm + dm (Figs. 12, 13). Abdominal sclerotization is relatively reduced, with abdominal terga 1–7 of male and 1–6 of female being covered only by a very small, median plate.

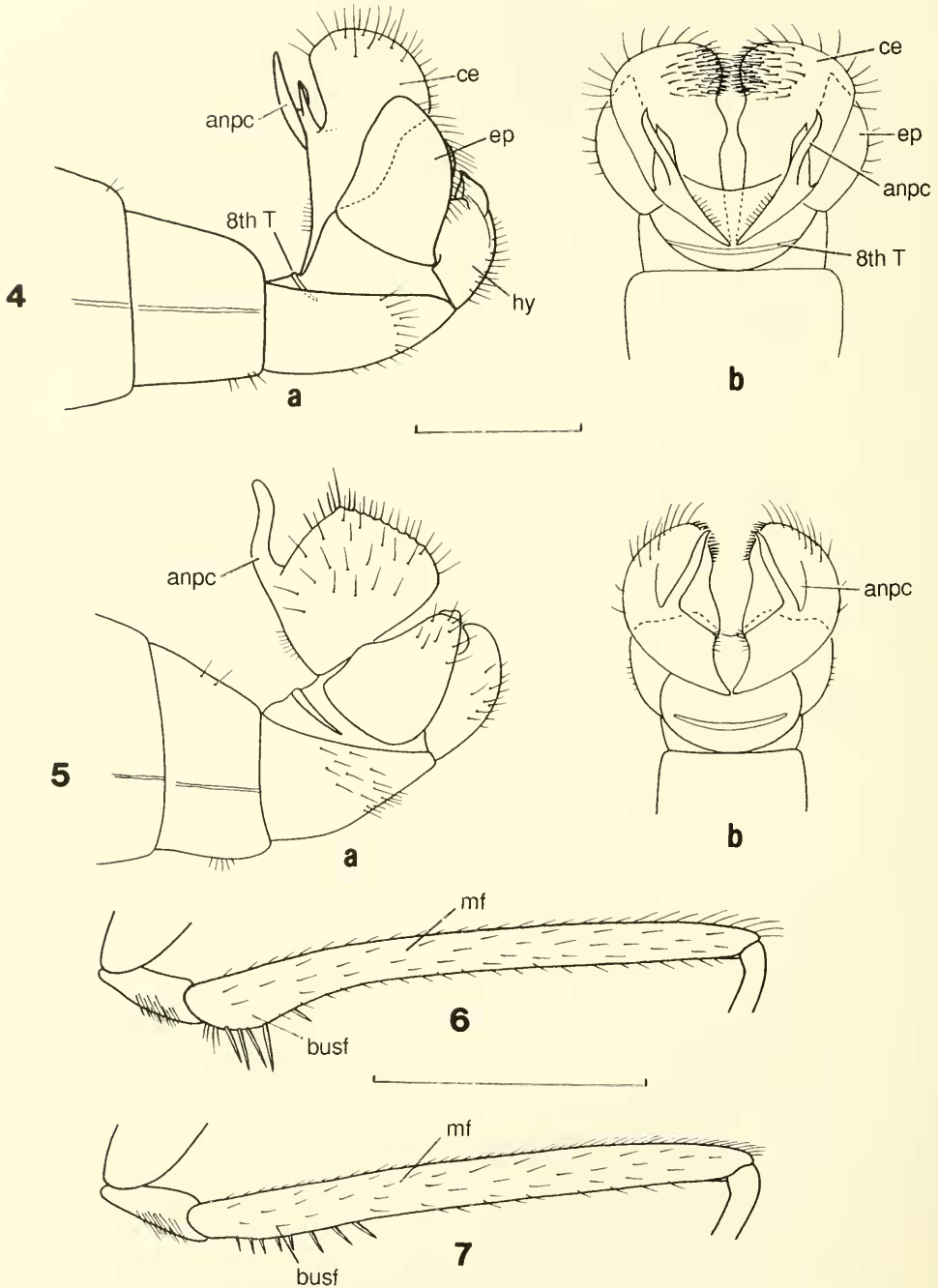
Description. — Slender, mostly black flies with yellowish white pruinescence. Body length including terminalia of males 2.0–3.5 mm, of females 2.5–4.0 mm. Mouthparts and palps yellow. Antennal style microscopic. Thorax slender, humeral area strongly differentiated. Propleural coloration ranging from yellow to black. Legs yellow, except distal 1–3 tarsomeres dark brown. Fore femur ventrally bearing row of black setulae and single larger setula (ranging in position from basal 1/3 to about midway), flanking bristles lacking, 3–4 yellow

bristles on each side basally, dense yellowish white hair fringe present on inner surface. Fore tibia with dense yellowish white hair fringe on inner surface. Mid femur of male with basoventral swelling of varying development (Figs. 6, 7) bearing 4–9 yellow bristles. Mid tibia of male bearing black setulae apicoventrally. Female lacking mid leg development and vestiture of male. Macrotrichiae reduced, yellow. Prominent head bristles including pair of ocellars and several inner and outer verticals. Prominent thoracic macrotrichiae including uniserial acrostichal and dorsocentral setae, pair of notopleural setae, pair of supraalar bristles, and small pair of scutellar setae with flanking pair of hairs. Wings hyaline, stigma lacking; humeral crossvein present; anal cell developed; crossvein bm-cu lacking; cells bm and dm confluent, giving rise apically to separate veins M_1 , M_2 and CuA_1 . Abdominal segments 1–7 of male and 1–6 of female weakly sclerotized. Male terminalia (see Fig. 4) including hypandrium with apicodorsal projection of differing structure and orientation; pair of epandrial lobes; pair of cerci of differing structure. Macrotrichiae on terminalia ranging from hairs to strong bristles, the latter restricted to inner surface of cercus. Female abdominal segment 8, fused tergum 9 + 10 and cerci forming an elongated, sclerotized ovipositor.

Remarks. — The species of *Neoplasta* treated here can be placed into three informal species groups. The *N. hebes* Melander group includes *N. hebes* and two new species described here, *N. hansonii* and *N. parahebes*. The *N. scapularis* Loew group includes *N. scapularis*, *N. megorchis* Melander and six species newly described here, *N. bifida*, *N. concava*, *N. deyruipi*, *N. octoterga*, *N. paramegorchis* and *N. scapuliformis*. A third informal species group is represented by *N. chrysopleura*, newly described here; additional species appearing to belong to this group occur in the Neotropical Region. No phylogenetic analysis has demonstrated the monophyly of these informal species groups,



Figs. 1-3. 1a (lateral) and b (dorsal), *Neoplasta chrysopleura* n. sp., male terminalia. 2a (lateral) and b (dorsal), *Neoplasta octoterga* n. sp., male terminalia. 3a (lateral) and b (dorsal), *Neoplasta scapuliformis* n. sp., male terminalia. anpc = anterior process of cercus; ce = cercus; ep = epandrial lobe; hy = hypandrium; 8th T = eighth abdominal tergum. Hypandrium removed in dorsal view. Scale bar = 0.25 mm.



Figs. 4-7. 4a (lateral) and b (dorsal), *Neoplasta bifida* n. sp., male terminalia. 5a (lateral) and b (dorsal), *Neoplasta deyrupi* n. sp., male terminalia. 6, *Neoplasta megorchis* mid leg of male; outer surface. 7, *Neoplasta scapularis* mid leg of male; outer surface. anpc = anterior process of cercus; busf = basoventral swelling of mid femur; ce = cercus; ep = epandrial lobe; hy = hypandrium; mf = mid femur; 8th T = eighth abdominal tergum. Hypandrium removed in dorsal view. Scale bars = 0.25 (Figs. 4, 5) and 0.5 mm (Figs. 6, 7).

but they are included to facilitate presentation in this paper and to serve as a basis for future research.

Recognition of the informal species groups is based on a combination of body size, venation, structure of abdominal tergum eight, degree of development of a basoventral swelling on the male mid femur, and male terminalia. The latter two structural features require explanation to facilitate use of the identification key.

The degree of development and number and arrangement of bristles on the basoventral swelling of the male mid femur is employed in the key, in part to obviate the need to macerate male terminalia. However, it may be difficult to interpret in the absence of specimens possessing alternative character states. Three descriptive terms are used to describe the structure: prominent, diffuse, and inapparent. Prominent (see Fig. 6) refers to a strongly developed swelling, with a swelling length to a mid femur diameter ratio of ca. 0.3/0.2. A prominent swelling is associated with an arched mid femur and possesses relatively few (usually 4–6) yellow bristles that are spaced closely together; one modification includes the distal bristle being off-set posterolaterally. Diffuse (see Fig. 7) refers to a less developed swelling with a swelling length to a mid femur ratio of ca. 0.5/0.2. A diffuse swelling is associated with a mid femur that is only weakly arched and possesses relatively more (usually 6–9) yellow bristles that are more widely spaced. Inapparent refers to virtually no development of a swelling and a mid femur that is nearly straight. An inapparent swelling possesses 8–9 yellow bristles of relatively weaker development and even wider spacing than found on a diffuse swelling.

Several taxonomically important structures of male terminalia, which are revealed in macerated specimens, often are visible without maceration and are employed in the key below. Included among such characteristics are the general orientation and shape

of the terminalia, the relative size and positional orientation of the cerci, and the structure of the anterior process on each cercus and the distal projection of the hypandrium. The orientation and shape of the cercus of nearly all species sorts into two forms: 1) oriented with long axis in a horizontal plane, more or less triangular apically in lateral view, and lacking an anterior process (Figs. 14–16); and 2) oriented with the long axis in a dorsal to anterodorsal plane, more or less broadly lobed in lateral view and possessing an anterior process (Figs. 4, 5, 8–11). The size of the cercus relative to that of the epandrial lobe and the shape of the anterior process of each cercus are useful in distinguishing species in the *N. scapularis* group. Within the *N. hebes* group, the shape and orientation of the distal projection of the hypandrium usually is discernable on specimens, but locating the structure often requires rotating the specimen and examining it from several angles.

KEY TO MALE ADULTS OF SPECIES OF *NEOPLASTA* COQUILLET OF AMERICA NORTH OF MEXICO

- 1. Mesopleuron and metapleuron golden yellow (*N. chrysopleura* group) ... *N. chrysopleura* n. sp.
- Mesopleuron and metapleuron black 2
- 2. Relatively small species, body length 2.0–2.4 mm; cercus elongated in a horizontal plane in lateral view, more or less triangular apically and lacking an anterior process (Figs. 12–14) (*N. hebes* group) ... 11
- Relatively large species, body length 2.8–3.5 mm; cercus elongated in a dorsal plane, smoothly lobed dorsally in lateral view and bearing an anterior process (*N. scapularis* group) ... 3
- 3. Abdominal tergum 8 elongated and sclerotized (Fig. 2), terminalia distinctly separated from abdominal segment 7 in dried specimens *N. octoterga* n. sp.
- Abdominal tergum 8 weakly developed, reduced to a thin crescent (see Fig. 3), terminalia and abdominal segment 7 closely associated in dried specimens 4
- 4. Epandrial lobe strongly convex, expanded dorsally to partially overlap cercus; anterior

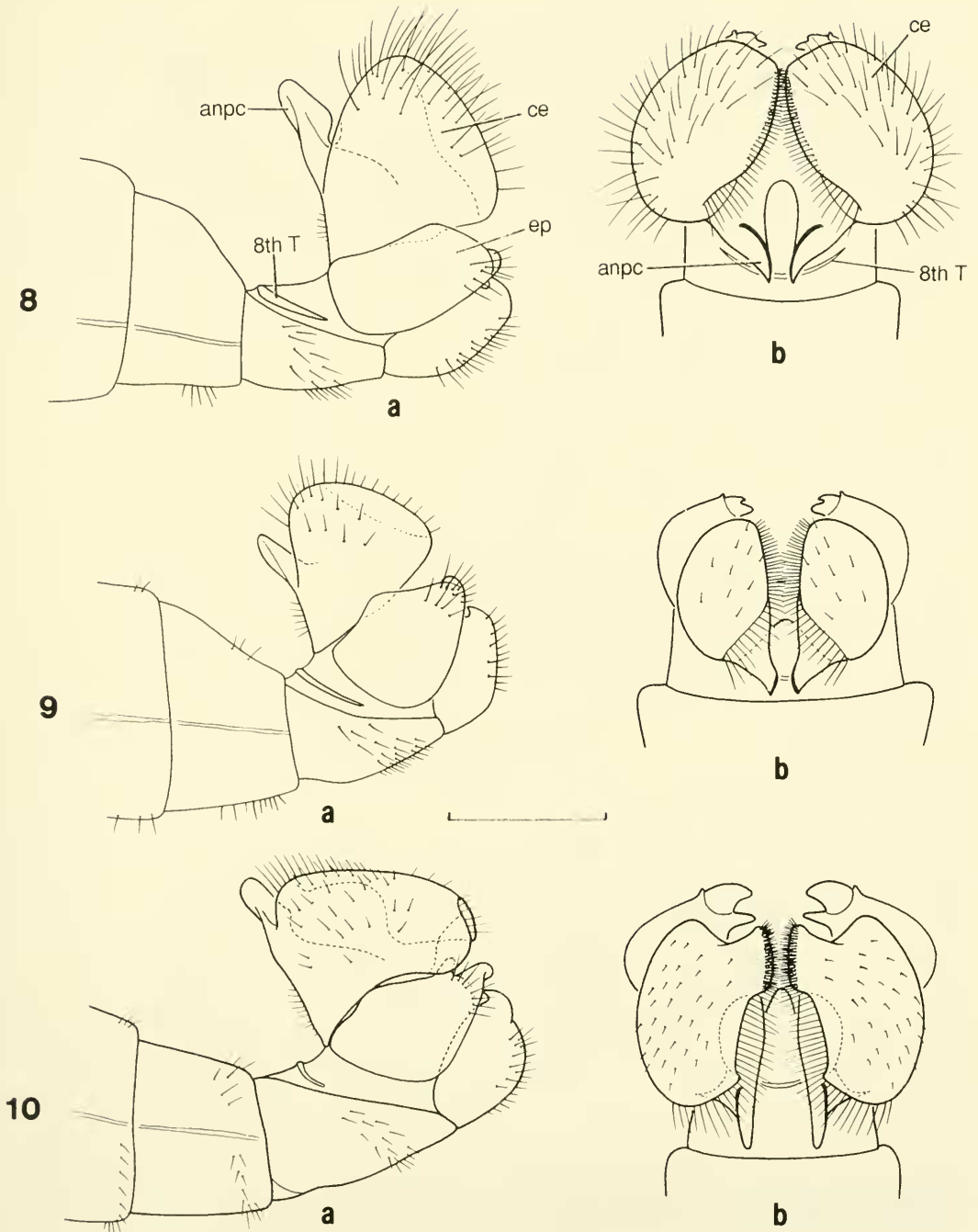
- process of cercus divided into two, sharply pointed projections (Fig. 4) *N. bifida* n. sp.
- Epandrial lobe not strongly convex, not expanded dorsally and not overlapping cercus; anterior process of cercus undivided, not sharply pointed apically 5
5. Anterior process of cercus broad and short, weakly differentiated from body of cercus; cercus appearing broadly excised over distal third along dorsal margin in lateral view (Fig. 3) *N. scapuliformis* n. sp.
- Anterior process of cercus strongly differentiated from body of cercus; cercus not appearing broadly excised over distal third along dorsal margin in lateral view 6
6. Anterior process of cercus recurved posteriorly in lateral view, slender throughout (Fig. 5) *N. deyrupi* n. sp.
- Anterior process of cercus straight in lateral view, usually broad basally and narrower apically 7
7. Mid femur with prominent basoventral swelling (Fig. 6) 8
- Mid femur with diffuse basoventral swelling (Fig. 7) 10
8. Setae on outer, dorsolateral surface of cercus longer than anterior process (Fig. 8) *N. megorchis* Melander
- Setae on outer, dorsolateral surface of cercus shorter than anterior process (see Fig. 10) 9
9. Body of cercus nearly rectangular, ca. 1.5–2.0× larger than epandrial lobe in lateral view; cercus internally excavated along medial margin (Fig. 10) *N. concava* n. sp.
- Body of cercus broadly triangular in lateral view, subequal in size to epandrial lobe (Fig. 9); cercus not excavated along medial margin *N. scapularis* (Loew), in part
10. Cercus 1.5–2.0× larger than epandrial lobe in lateral view; anterior process of cercus usually clearly visible in unmacerated material, smoothly truncate apically (Fig. 11) *N. paramegorchis* n. sp.
- Cercus and epandrial lobe subequal in size; anterior process of cercus in unmacerated material, narrowly lobed apically (Fig. 9) *N. scapularis* (Loew), in part
11. Apicodorsal lobe of cercus elongated, ca. ½ length of cercus, slender; distal projection of hypandrium extending anterodorsally in lateral view; phallic process inapparent (Fig. 14) *N. parahebes* n. sp.
- Apicodorsal lobe of cercus relatively short and broad, ca. ½ length of cercus; distal projection of hypandrium extending posterodorsally in lateral view; phallic process prominent, ending in 2 hooks 12
12. Apex of epandrial lobe turned ventrolaterally; distal projection of hypandrium pointed, not expanded laterally in posterior view (Fig. 15) *N. hebes* Melander
- Apex of epandrial lobe turned dorsolaterally; distal projection of hypandrium anchor or shovel shaped, distinctly expanded laterally in posterior view (Fig. 16) *N. hansonii* n. sp.

THE *N. HEBES* SPECIES GROUP

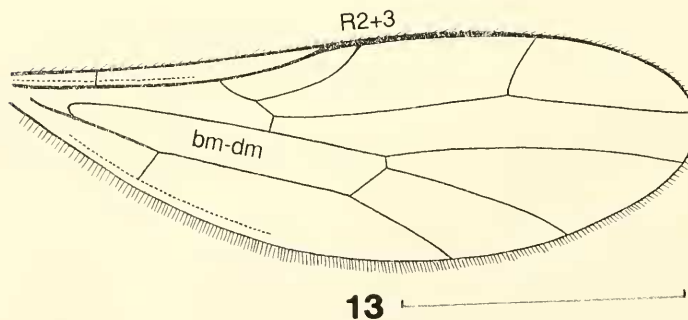
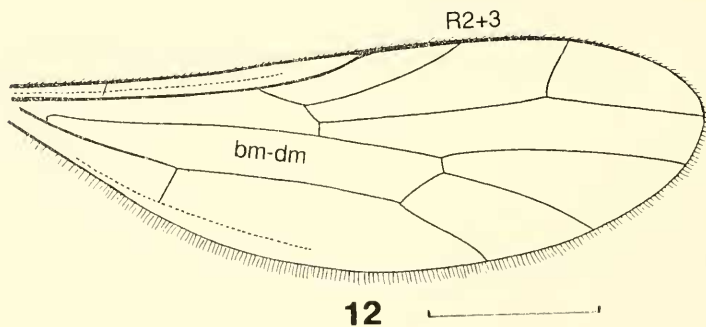
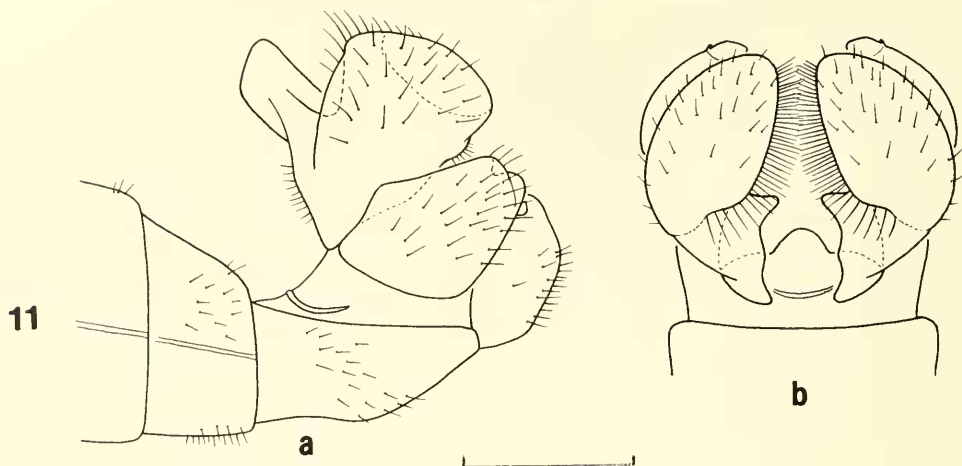
Adults of species in this informal species group share several features. They are relatively small (body length including terminalia of male 2.0–2.4 mm, of female 2.6–3.0 mm), the propleuron is black, and vein R_{2+3} usually is strongly curved anteriorly and joins C about 0.25 distance between R_1 and R_4 (Fig. 13). Males are characterized by terminalia with the long axis in a horizontal plane (Figs. 14–16), each cercus being more or less triangular apically and lacking an anterior process, the hypandrium bearing a pair of phallic processes, abdominal tergum 8 being split into two lateral plates (Figs. 14–16), and the basoventral swelling on the mid femur being weakly developed (see Fig. 7). Species can be identified by their male terminalia, but females appear inseparable. The group is restricted to western North America, with representatives extending into the Neotropical Region.

Neoplasta hansonii MacDonald & Turner, NEW SPECIES (Fig. 16)

Diagnosis.—Male terminalia resemble those of males of *N. hebes*, but differ in the following respects: the apex of the epandrial lobe is in-turned posterodorsally and the distal projection of the hypandrium is expanded laterally, resulting in a more or less shovel shaped structure. Similar to macerated terminalia of males of *N. hebes*, those of *N. hansonii* possess a pair of phallic processes surrounding the phallus, each of which ends in two hook-like structures; in com-



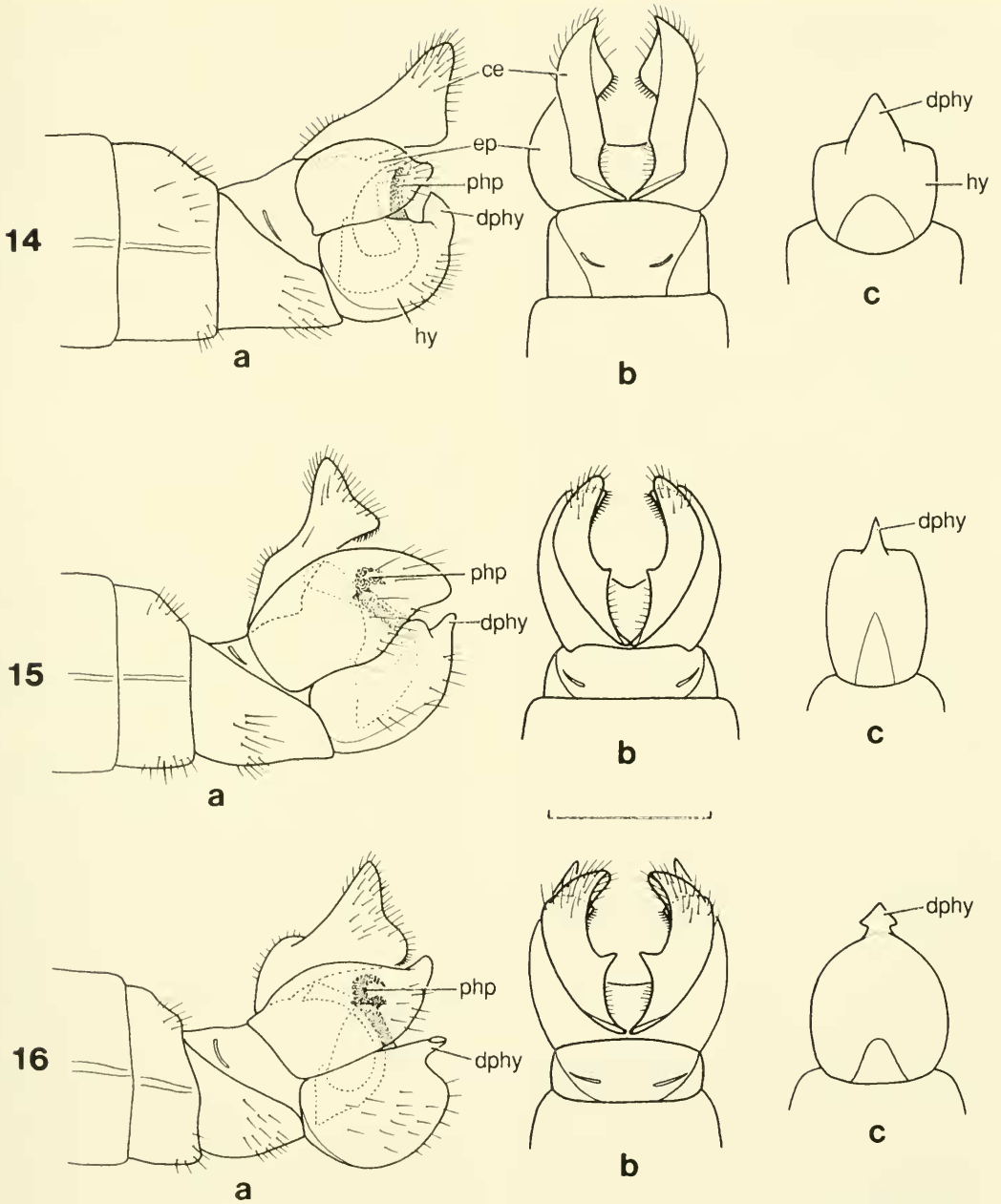
Figs. 8-10. 8a (lateral and b (dorsal), *Neoplasta megorchis*, male terminalia. 9a (lateral) and b (dorsal), *Neoplasta scapularis*, male terminalia. 10a (lateral) and b (dorsal), *Neoplasta concava* n. sp., male terminalia. anpc = anterior process of cercus; ce = cercus; ep = epandrial lobe; hy = hypandrium. Hypandrium removed in dorsal view. Scale bar = 0.25 mm.



Figs. 11-13. 11a (lateral) and b (dorsal), *Neoplasta paramegorchis* n. sp., male terminalia. 12, *Neoplasta scapularis* wing. 13, *Neoplasta hebes* wing. bm-dm = cell; R2+3 = vein. Hypandrium removed in dorsal view. Scale bars = 0.25 mm (Fig. 11) and 1.0 mm (Figs. 12, 13).

parison, the weakly developed phallic processes of males of *N. parahebes* are smoothly truncate apically, lacking hook-like development, and difficult to discern.

Description.—MALE. Body length including terminalia ca. 2.3-2.4 mm. Propleuron black. Basoventral swelling of mid femur weakly developed, bearing row of 7-



Figs. 14–16. 14a (lateral), b (dorsal) and c (ventral), *Neoplasta parahebes* n. sp., male terminalia. 15a (lateral), b (dorsal) and c (ventral), *Neoplasta hebes* male terminalia. 16a (lateral), b (dorsal) and c (ventral), *Neoplasta hansonii* n. sp., male terminalia. ce = cercus; dphy = distal projection of hypandrium; ep = epandrial lobe; hyp = hypandrium; php = phallic process. Hypandrium removed in dorsal view. Scale bar = 0.25 mm.

9 (usually 8) weak, yellow bristles (see Fig. 7). Vein R_{2+3} usually strongly curved anteriorly, joining C about 0.25 distance between R_1 and R_4 (see Fig. 13). Terminalia (Fig. 16) with long axis in a horizontal plane; hypandrium with distal projection more or less shovel shaped in posterior view, extending posteriorly in lateral view; epandrial lobe with apex turned posterodorsally; cercus triangular distally in lateral view, tightly associated with epandrial lobe; phallic process ending in 2 hook-like structures projecting posteriorly. FEMALE. Similar to male in coloration and venation, but larger, ca. 2.6–2.8 mm; indistinguishable from females of other species in the *N. hebes* group.

Type material.—HOLOTYPE male, labelled: "UTAH Utah Co/Prov/11–18 Sep 1985/Malaise trap" (USNM). The specimen is in excellent condition and most of the diagnostic features of terminalia visible without maceration. ALLOTYPE, same data as holotype (USNM). PARATYPES. California: 11 males, 2 females, Nevada Co., Jul (UCR); 1 male, Stanislaus Co., Turlock Lk. Rec. Area, Sep (UKL); 1 male, Tehama Co., S. Frk. Battle R., May (UNH); 1 male, Calaveras Co., San Andreas, Jun (WSU). Idaho: 1 male, Franklin Co., Thomas Spr., Jun (USU); 1 male, Snake R., Divide Crk., May (USNM). Nebraska: 1 male, Redington, May (USNM). Utah: 15 males, 12 females, Cache Co., Jun–Jul; 3 males, 3 females, Kane Co., 6 mi N. Kanab, Jun; 2 males, Utah Co., Mapleton, Jul; 18 males, 9 females, Utah Co., Provo, Jun–Sep (USU; PERC); 2 males, Cache Co., Jul (CAS). Washington: 2 males, Columbia Co., 20 mi E. Dayton, May (WSU); 1 male, Wawawai, Jun (USNM).

Distribution.—Males of this species are known from northcentral California and southeastern Washington east to extreme western Nebraska (Fig. 20).

Etymology.—This species is named in honor of W. J. Hanson, who collected the type series and who also has contributed excellent material representing other *Neo-*

plasta and other genera of Hemerodromiinae.

Remarks.—The shape of the apicodorsal projection of the hypandrium appears to vary somewhat with the structure being more expanded laterally on specimens from California and western Nebraska in comparison to specimens from southeastern Washington, Idaho and Utah. No other consistent differences were found among males from throughout the range.

Neoplasta hebes Melander

(Figs. 13, 15)

Neoplasta hebes Melander, 1947: 261.

Diagnosis.—Males of *N. hebes* are differentiated from those of other members of the *N. hebes* group by the down-turned apex of the epandrial lobe and the pointed distal projection of the hypandrium that extends posterodorsally. Also, the cerci appear to be more loosely associated with the epandrial lobes in dried specimens.

Description.—Body length including terminalia of male ca. 2.0–2.3 mm, of female ca. 2.4–2.6 mm. Propleuron black. Mid femur of male with weakly developed basoventral swelling bearing row of 5–8 (usually 6) weak, yellow bristles (see Fig. 7); female lacking swelling and vestiture of male. Vein R_{2+3} usually strongly curved anteriorly, joining C about 0.25 distance between R_1 and R_4 (Fig. 13). Male terminalia (Fig. 15) with long axis in a horizontal plane; hypandrium with pointed distal projection extending posterodorsally in lateral view; cercus triangular distally in lateral view, loosely associated with epandrial lobe; apex of epandrial lobe turned ventrolaterally; phallic process ending in 2 hook-like structures projecting posteriorly, visible upon maceration. Female similar to male in coloration and venation, but slightly larger; indistinguishable from females of other species in the *N. hebes* group.

Type material examined.—HOLOTYPE male, labelled "Berkeley/Aug '15, Cal./A.

L. Melander" (USNM). The specimen is in excellent condition and most of the diagnostic features of terminalia visible without maceration; the elaborated type locality is California, Alameda County, near the city of Berkeley. PARATYPES. California: 1 male, 1 female, Contra Costa Co., San Pablo, Nov; 1 male, Santa Cruz Co., Felton, May (CU); 1 male, 3 females, Santa Clara Co., Live Oak Prk., Jul; 11 males, 3 females, San Bernardino Co., Scotland, Sep. (USNM).

Other material examined.—Arizona: 1 male, 2 females, Cochise Co., 5 mi W. Portal, May (UCR). California: 6 males, 2 females, Contra Costa Co., Mt. Diablo St. Prk., Jun–Aug; 2 males, 1 female, Contra Costa Co., Briones Reg. Prk., May; 1 male, Los Angeles Co., Angeles Nat. For., Islip Cyn., Jun; 18 males, 1 female, Los Angeles Co., San Gabriel R. (north fork), 2 mi S. Goldbrook Sta., Apr–Jun; 9 males, 12 females, Marin Co., Mt. Tamalpais, Jul; 1 male, 1 female, Mendocino Co., Leggett, May; 1 male, Napa Co., 2 mi NNE Angwin, Nov; 1 male, Siskiyou Co., Klamath Nat. For., Jul (CAS); 1 male, San Bernardino Co., Big Morengo Cyn., Mar; 1 male, 2 females, San Bernardino Co., San Bernardino Mts., Thurman Flat, May (UCR). Oregon: 1 male, Marion Co., Enchanted Forest, 11 km S. Salem, Aug; 1 male, 2 females, Marion Co., Silver Falls St. Prk., Jun (CAS); 1 male, Multnomah Co., Troutdale, Aug (USNM). Washington: 1 male, Pierce Co., Glover Crk., Aug (USU).

Distribution.—Males of this species are known from western Washington and Oregon, California, and extreme southeastern Arizona (Fig. 20).

Neoplasta parahebes MacDonald &
Turner, NEW SPECIES
(Fig. 14)

Diagnosis.—Males are differentiated from those of *N. hebes* and *N. hansonii* by the shape of the cercus, shape and orientation of the distal projection of the hypandrium,

and the weakly developed phallic processes. Each cercus is expanded apicodorsally into a lobe that is about half the total length of the cercus, with a weakly developed apicoventral projection. The distal projection of the hypandrium is distinctive in being bluntly pointed and extending anterodorsally, and the phallic processes differ in being weakly developed and lacking hook-like structures.

Description.—MALE. Body length including terminalia ca. 2.0–2.2 mm. Propleuron black. Mid femur with weakly developed basoventral swelling bearing row of 6–8 (usually 6) weak, yellow bristles (see Fig. 7). Vein R_{2+3} usually strongly curved anteriorly, joining C about 0.25 distance between R_1 and R_4 (see Fig. 13). Terminalia (Fig. 14) oriented in a horizontal plane; hypandrium with distal projection bluntly pointed at apex, extending anterodorsally; cercus elongated apicodorsally, resulting in dorsal lobe being ca. $\frac{1}{2}$ length of cercus, with weakly developed apicoventral projection; apex of epandrial lobe oriented posteriorly; phallic processes of hypandrium straight and smoothly truncate apically, difficult to discern even when macerated. FEMALE. Similar to male in coloration and venation, but slightly larger, ca. 2.4–2.6 mm; indistinguishable from females of other species in the *N. hebes* group.

Type material.—HOLOTYPE male, labelled: "WASHINGTON: Brooks/Mem. SP, 12 mi. NE/Goldendale, Klickitat/Co., 2700–3000 ft./27-VI-1975/W. J. Turner" (USNM). The specimen is in excellent condition and most of the diagnostic features of terminalia visible without maceration. The elaborated type locality is Washington, Klickitat County, Brooks Memorial State Park, about 70 kilometers south of the city of Yakima. ALLOTYPE, same data as holotype (USNM). PARATYPES. CANADA. British Columbia: 1 male, Robson, May (CNC). UNITED STATES. California: 1 male, 8 females, Humboldt Co., Six Rivers Nat. For., Jul; 7 males, Marin Co., Apr–

May: 6 males, 2 females, Mendocino Co., E. of Covelo. Jun: 1 male, Monterey Co., Los Padres Nat. For., San Antonio R., May: 4 males, 1 female, Plumas Co., Lassen Nat. For., n. frk. Feather R., May (CAS); 1 male, Oak Glen. Jul: 1 male, Mt. Home. Jul (USNM); 2 males, San Bernardino Co., Kilpecker Cr., June (UCR). Idaho: 2 males, Latah Co., Moscow Mt., Jun (USNM); 1 male, 47 females, Kootenai Co., 10 mi N. Harrison. July (WSU). Oregon: 1 male, Jackson Co., Hepsie Mt. Rd., Jun (USU); 1 male, Baker Co., 36 mi SE Union. Jun (WSU). Washington: 14 males, 8 females, Asotin Co., Field Springs St. Prk., Jun-Jul; 3 males, 4 females, Columbia Co., 20 mi S. Dayton, May: 3 males, 16 females, Klickitat Co., Brooks Mem. St. Prk., Jun: 1 male, Yakima Co., 8 mi SW Tieton. Jun (WSU); 1 male, Vashon, May (USNM).

Distribution.—Males of this species are known from southcentral British Columbia, northcentral Idaho and Washington, south into extreme southern California (Fig. 20).

Etymology.—The specific epithet is an arbitrary combination of letters incorporating "para," Greek for beside or near, and "hebes," alluding to the close structural similarity between the new species and *N. hebes*.

Remarks.—*Neoplasta parahebes* and *N. hebes* are sympatric and may represent relatively recent divergences, with hybridization occasionally occurring. This conclusion is based on the existence of two males, from two widely separated areas of sympatry, that possessed cerci of intermediate structure.

THE *N. SCAPULARIS* SPECIES GROUP

Adults of this group are larger (body length of male including terminalia 2.8–3.4 mm) than those of the *N. hebes* group and vein R_{2-3} gradually curves anteriorly and joins C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Males are characterized by the long axis of terminalia being oriented in a more or less vertical plane (Figs. 2–5, 8–11),

each cercus being smoothly lobed and bearing an anterior process, the hypandrium lacking development of phallic processes, abdominal tergum 8 typically being collar-like (Figs. 3–5, 8–11), and the basoventral swelling on the mid femur ranging from weakly to strongly developed (see Figs. 6, 7). The group includes western and southwestern species, including some that extend into the Neotropical Region, but also includes two taxa in the eastern United States, one of which may be a species complex occurring throughout North America.

Neoplasta bifida MacDonald & Turner, NEW SPECIES (Fig. 4)

Diagnosis.—Males are characterized by the deeply cleft anterior process of the cercus, which consists of two blade-like projections.

Description.—Body length including terminalia ca. 3.0 mm. Propleuron black. Mid femur with prominent basoventral swelling, bearing 4 closely spaced, yellow bristles (see Fig. 6); mid tibia bearing distal row of black setulae. Vein R_{2-3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Terminalia (Fig. 4) oriented in a vertical plane; epandrial lobe strongly convex, projecting apicodorsally and partially overlapping cercus; cercus broadly oval in a dorsal plane in lateral view, bearing bifid anterior process consisting of 2 blade-like projections of unequal length. FEMALE. Similar to male in size, coloration and venation; indistinguishable from females of other species of the *N. scapularis* group that have a black propleuron.

Type material.—HOLOTYPE male labelled: "ARIZ: Pima Co., Catalina/Mtns., Marshall Gulch/near Summerhaven, 28 May/1986. J. Jenkins coll" (USNM). The specimen is in excellent condition, with macerated terminalia in a glycerin microvial attached to pin; the type locality is about

30 kilometers northeast of the city of Tucson. PARATYPES. MEXICO: Durango: 1 male, 10 mi W. El Salto, Jun (CNC). UNITED STATES: Arizona: 7 males, 16 females, same data as holotype (WSU); 1 male, Cochise Co., Chiricahua Mts., May (WSU); 13 males, 8 females, Cochise Co., 5 mi W. Portal, Oct–Dec (AMNH); 1 male, 1 female, Cochise Co., Chiricahua Mts., Sep (USU).

Distribution.—Males of this species are known only from extreme southeastern Arizona and from near Durango, Mexico (Fig. 19).

Etymology.—The specific epithet is from the Latin word “bifidus,” meaning split into two parts, in reference to the deeply cleft anterior process of each cercus.

Neoplasta concava MacDonald &
Turner, NEW SPECIES
(Fig. 10)

Diagnosis.—Males are distinguished by a more or less smoothly rectangular cercus, which is oriented in an anterodorsal plane in lateral view, and the prominent basoventral swelling of the mid femur. Maceration is necessary to reveal the diagnostic cavity on the median margin of the cercus, but the shape of the cercus differs from similar species on which it is more or less triangular in lateral view.

Description.—MALE. Body length including terminalia ca. 3.2 mm. Propleuron typically brown, occasionally nearly black. Mid femur with prominent basoventral swelling, bearing row of 6–8 closely spaced, yellow bristles (see Fig. 6); mid tibia indented apically, with distal ¼ bearing black setulae. Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Terminalia (Fig. 10) oriented in a vertical plane; cercus more or less rectangular in an anterodorsal plane in lateral view, ca. 1.5–2.0× larger than epandrial lobe; cercus deeply excavated along median margin; anterior process of cercus broadly lobed distally. FEMALE.

Similar to male in size, color, and venation; indistinguishable from other species of the *N. scapularis* group that have either a brown or black propleuron.

Type material.—HOLOTYPE male, labelled: “Utah: Wayne Co./Capital Reef N. Prk./Pleasant Crk./V.31–VI.2-1992/J. F. MacDonald” (USNM). The specimen is in excellent condition and most of the diagnostic features of terminalia visible without maceration; the type locality is Capitol Reef National Park in southcentral Utah. ALLOTYPE, same data as holotype (USNM). PARATYPES. Arizona: 1 male, Alpine, Jun (USNM); 5 males, 4 females, Cochise Co., Chiricahua Mts., May (WSU); 1 male, Cochise Co., 5 mi SW Portal, May–Jun (USNM); 4 males, 25 females, Cochise Co., Huachuca Mts., Mar–Apr (CNC); 1 male, Patagonia: 2 males, White Mts., Jul (USNM). Colorado: 2 males, 3 females, Park Co., 11 Mile Cyn., 8 mi SW Florissant, Jun (MAC; PERC); 1 male, Chaffee Co., Buena Vista, Jun (CNC). New Mexico: 2 males, 4 females, Grant Co., Iron Crk. Cmpgr., Jun–Jul (USU); 1 male, Los Alamos Co., Jemez Sprs., Jul (UKL). Utah: 3 males, 4 females, Cache Nat. For., Wasatch Mts., Jul (USNM); 1 male, 2 females, Capital Reef Nat. Prk., Garfield Co., Sulphur Crk., Aug (USU); 8 males, 1 female, Capitol Reef Nat. Prk., Wayne Co., May–Jun (USNM); 1 male, Millard Co., Fool Crk. Pass, Jun (USU); 2 males, Utah Co., Mapleton, Aug (USU); 4 males, 3 females, Washington Co., Leeds Cyn., Jun and Sep (CAS, USU); 1 male, 1 female, Washington Co., Zion Nat. Prk., Jun (USU).

Distribution.—Males of this species are known from the central Rocky Mountains south into extreme southern Arizona and New Mexico (Fig. 18).

Etymology.—The specific epithet is from the Latin word “concavus,” in reference to the relatively deep excavation along the inner margin of each cercus, which is visible only upon maceration.



Fig. 17. Distribution of *Neoplasta scapularis*.



Fig. 18. Distribution of *Neoplasta concava*, *N. megorchis*, *N. paramegorchis* and *N. scapuliformis*.

Remarks.—*Neoplasta concava* may on occasion hybridize with *N. scapularis*, as evidenced by one male collected near Pata-gonia, Arizona that possessed terminalia intermediate between the two species.

Neoplasta deyrupi MacDonald &
Turner, NEW SPECIES
(Fig. 5)

Diagnosis.—Adults closely resemble those of *N. scapularis* in general structure and coloration. Males of *N. deyrupi*, however, are easily distinguished by the elongate, re-curved anterior process on each cercus, which typically is visible on unmacerated specimens.

Description.—MALE. Body length including terminalia ca. 3.5 mm. Propleuron brown to dark brown. Mid femur with diffuse basoventral swelling, bearing row of 8–9 yellow bristles (see Fig. 7), the distal 2 more widely spaced and slightly off-set posterolaterally; mid tibia ventrally bearing black setulae over distal $\frac{1}{4}$. Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Terminalia (Fig. 5) oriented in a vertical plane; cercus broadly triangular in anterodorsal plane, slightly larger than epan-drial lobe; anterior process of cercus elongate and slender, curving posteriorly upward and inward. FEMALE. Similar to male in size, coloration, and venation; indistinguishable from females of other species of the *N. scapularis* group that have a brown propleuron.

Type material.—HOLOTYPE male, labelled: "USA: Indiana/Tippecanoe Co./5 km W. Lafayette/May 10, 1992/J. F. MacDonald" (CNC, holotype no. 21339). The specimen is in excellent condition and the diagnostic features of the terminalia visible without maceration. ALLOTYPE, same data as holotype (CNC). PARATYPES. Indiana: 16 males, 10 females, same data as holotype, May–Jul (MAC, PERC). Georgia: 1 male, Rabun Co., Pine Mt., May; 1 male, White Co., Unicoi St. Prk., Jun (CNC); 1 male, Rabun Co., Black Rock Mt., May

(CU). North Carolina: 1 male, Black Mt., May (AMNH). Virginia: 1 male, Loudoun Co., Harpers Ferry, May (CNC). South Carolina: 1 male, Spartanburg, Jun (USNM).

Distribution.—Males of this species are known from Indiana, and the central and southern Appalachian Mountains (Fig. 19).

Etymology.—This species is named after Mark Deyrup, who made collecting in Indiana enjoyable and contributed part of the material in the type series from West Lafayette.

Remarks.—Based on specimens collected in Malaise traps placed along and across small streams in hardwood forest in Indiana, *N. deyrupi* exhibits an adult flight period that appears to be limited to May and early June. This early season activity may be a consequence of larval development in small streams that tend to cease flowing by mid-summer. Additional collecting likely will reveal more widespread distribution over eastern North America now that this species is distinguished from *N. scapularis*.

Neoplasta megorchis Melander,
NEW STATUS
(Figs. 6, 8)

Neoplasta scapularis variety *megorchis* Melander, 1947: 263.

Diagnosis.—Males are recognized by the long setae on the outer surface of the large, broadly triangular cercus; they also are characterized by the strongly developed baso-ventral swelling on the mid femur, including an off-set distal bristle, and a brownish propleuron. Males of *N. concava*, which are similar in general appearance to those of *N. megorchis*, differ in possessing relatively short setae on a more or less rectangular cercus.

Description.—MALE. Body length including terminalia ca. 3.2 mm. Propleuron brown. Mid femur with prominent baso-ventral swelling, bearing closely spaced row of 4–5 (usually 4) yellow bristles, with an additional distal bristle off-set posterolater-

ally (Fig. 6). Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Terminalia (Fig. 8) oriented in a vertical plane; cercus broadly triangular in anterodorsal plane in lateral view, ca. $2\times$ larger than epandrial lobe; setae on outer surface longer than anterior process; anterior process of cercus broadly lobed apically, narrowed basally, bearing patch of black setulae on inner surface. FEMALE. Similar to male in size, coloration, and venation; indistinguishable from females of other species of the *N. scapularis* group that have a yellowish brown to dark brown propleuron.

Type material examined.—HOLOTYPE male labelled, "Ilwaco, Washington/May 25, 1917/A. L. Melander" (USNM). The specimen is in fair condition, lacking the head and all but the coxa of the right front leg; the macerated terminalia (JFM, July 1988) are in a glycerin microvial attached to the pin. The elaborated type locality is Washington, Pacific County, Illwaco, about 20 kilometers northwest of Astoria, Oregon. PARATYPES: California: 1 male, Humboldt Co., Blue Lk., Jun; 1 male, Santa Cruz Co., Santa Cruz Mts., Jul (USNM). Oregon: 2 males, Curry Co., Humbug St. Prk., Aug; 1 male, Washington Co., Forest Grove, Jun; (USNM). Washington: 1 male, Island Co., Orcas Island, Aug (USNM).

Other specimens examined.—California: 1 male, Monterey Co., Big Sur, Sep (USNM). Oregon: 1 male, 1 female, Wallowa Co., Minam R., Jul (CAS). Washington: 5 males, Asotin Co., Asotin Crk., Jun–Aug (WSU).

Distribution.—Males of this species are known from Washington, Oregon and the coastal mountains of northern and central California (Fig. 18).

Neoplasta octoterga MacDonald &
Turner, NEW SPECIES
(Fig. 2)

Diagnosis.—Males are characterized by the unusual development of the eighth abdominal tergum, which is elongated and

sclerotized. As a result, the terminalia are distinctly separated from the seventh abdominal segment, a condition that is apparent even on unmacerated, dried specimens.

Description.—MALE. Body length including terminalia ca. 2.8 mm. Propleuron yellow or black. Mid femur with diffuse basoventral swelling (see Fig. 7); vestiture variable, either 8–9 yellow bristles or 2–5 stronger, yellow bristles. Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Abdominal segment 8 (Fig. 2) elongate, tubular, with tergal plate deeply excised basally in dorsal view. Terminalia (Fig. 2) oriented in a vertical plane; cercus broadly oval and elongated in a dorsal plane, posterior margin lobed; anterior process of cercus weakly to moderately developed. FEMALE. unknown.

Type material.—HOLOTYPE male, labelled, "U. S. A.: OREGON: Hood/River Co. Starvation/Creek State Park, at/falls. 26 June 1978/D. D. Wilder collector" (CAS). The specimen is in good condition and most of the diagnostic features of terminalia visible without maceration; the type locality is about 20 kilometers west of the town of Hood River. PARATYPES. CANADA. British Columbia: 1 male, Trans. Canada Hwy. #1, Chase Crk. Falls, Aug, (CAS). UNITED STATES. California: 3 males, Modoc Co., Cedar Pass Cmpgr., Aug; 1 male, Mono Co., 8 mi N. Bridgeport, Jul (CAS). Idaho: 1 male, Nez Perce Co., Soldier's Mdw. Reservoir, 45 km SE Lewiston, Jul (CAS). Oregon: 1 male, same data as holotype; 2 males, Josephine Co., 3 km S. Cave Junction, Jun (CAS). Utah: 2 males, Cache Co., Blacksmith Frk., Jul; 1 male, Washington Co., Leeds Cyn., Sep (USU).

Distribution.—Males of this species are known from the westcentral United States north into southcentral British Columbia (Fig. 19).

Etymology.—The specific epithet is formed from the Latin words "octo," for



Fig. 19. Distribution of *Neoplasta bifida*, *N. deyrupi*, *N. chrysopleura*, and *N. octoterga*.



Fig. 20. Distribution of *Neoplasta hebes*, *N. hansonii*, and *N. parahebes*.

eight, and "terga," for back, in reference to the distinctive eighth abdominal tergum.

Remarks.—Males of this species appear to vary in propleural coloration and the degree of development of the anterior process of the cercus. A male from Utah, with terminalia identical to the holotype, differed in possessing a black propleuron. In comparison to other males of *N. octoterga*, the anterior process of each cercus on one from northeastern California and another from northern Utah is relatively well developed.

Neoplasta paramegorchis MacDonald & Turner, NEW SPECIES
(Fig. 11)

Diagnosis.—Males are characterized by a unique combination of features, some of which individually can be found in males of other species. Each cercus is triangular in lateral view and about 1.5–2.0 times larger than the corresponding epandrial lobe, the setae on the outer surface of each cercus are shorter than the anterior process, the anterior process of each cercus is broadly truncate apically, the propleuron is yellow (occasionally yellowish brown), and the basoventral swelling on the mid femur is diffuse.

Description.—MALE. Body length including terminalia ca. 3.2 mm. Propleuron yellow, occasionally yellowish brown. Mid femur with diffuse basoventral swelling (see Fig. 7), bearing row of 6–8 (usually 6) yellow bristles. Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Terminalia (Fig. 11) oriented in a vertical plane; cercus broadly triangular in an anterodorsal plane in lateral view, ca. 1.5–2.0× larger than epandrial lobe; anterior process of cercus broad and smoothly truncate apically, bearing large patch of black setulae on inner surface. FEMALE. Similar to male in size, coloration, and venation; indistinguishable from female of other species of the *N. scapularis* group that have a yellow propleuron.

Type material.—HOLOTYPE male, la-

belled: "Utah Cache Co/Logan Cyn, Turner/C. G. 16–30 Aug 85/W. J. Hanson" (CNC, holotype no. 21340). The specimen is in excellent condition and most of the diagnostic features of terminalia visible without maceration; the type locality is Logan Canyon northeast of the city of Logan. ALLOTYPE, same data as holotype (CNC). PARATYPES. CANADA. Alberta: 3 males, Jumping Pd. Crk., 20 mi W. Calgary, Jun–Aug; 1 male, 15 mi E. Morley, Aug; 1 male, Mt. View, Jun (CNC); 1 male, Wild Hay R. at Highway 40, Jul (CAS). UNITED STATES. Arizona: 7 males, 1 female, Cochise Co., nr. Portal, Jun (USNM); 10 males, 3 females, Coconino Co., Havashu Falls, Mar (UCR). California: 1 male, Mono Co., Leavitt Mdw., Aug (CAS). Colorado: 1 male, 1 female, Gunnison Co., 17.7 km SE Cimarron (CAS); 1 male, Eagle Co., State Bridge, nr. Bond, Jun (CNC); 1 male, Summit Co., Frisco, Jun (USNM). Idaho: 2 males, 3 females, Bear Lk. Co., nr. Montpelier, Aug (CAS); 2 males, 1 female, Caribou Co., Kendall Crk., Jun–Jul; 1 male, Franklin Co., Aug (USU). Montana: 2 males, Jefferson Isle., Jul; 1 male, Vernon, Aug (USNM, WSU). New Mexico: 14 males, 15 females, Grant Co., Pinos Altos, Jun; 1 male, Jemez Sprs., Jul; 1 male, Oak Cr., nr. Flagstaff, May; 1 male, Reserve, Jun (CAS, USNM). South Dakota: 3 males, Lawrence Co., Spearfish Crk., 1 female, Beaver Crk., Jun (USNM). Utah: 7 males, 5 females, Capitol Reef Nat. Prk., Wayne Co., May–Jun (USNM); 1 male, Cache Co., Beaver Mt., Aug; 11 males, 12 females, Cache Co., Blacksmith Frk., Jun–Jul; 3 males, Cache Co., Franklin Basin, Jul; 1 male, Cache Co. W. Hodges Cyn., Aug; 123 males, 119 females, Cache Co., Logan Cyn., Jun–Aug; 1 male, 13 females, Cache Co., Logan, Jun–Sep; 26 males, 13 females, Utah Co., Provo, Jun–Sep; 4 males, Washington Co., Leeds Cyn., Jun; 2 males, Washington Co., Lower Deep Crk., Aug; 1 male, Upper Deep Crk., Aug; 1 male, Washington Co., Wiley Crk., Sep (USU); 2 males, Cache Co., Blacksmith

Frk., Jul (CAS). Wyoming: 1 male, Little Wind R., Sep (AMNH); 1 male, 3 females, Dubois, Sep (FSCA, USNM); 1 female, Bull Lk., Sep; 1 female, Dimwiddie Crk., Sep; 1 male, 2 females, Divide Crk., Sep; 2 females, Torrey's Lk., Sep; 1 male, Yellowstone, Jul (USNM).

Distribution. — The vast majority of specimens have been collected in the Rocky Mountains from Alberta south to extreme southern New Mexico and Arizona, but males also are known from eastern California and western South Dakota (Fig. 18).

Etymology. — The specific epithet is an arbitrary combination of letters incorporating "para," Greek for beside or near, and "megorchis," alluding to the structural similarity between the new species and *N. megorchis*.

Remarks. — Minor variation in the structure of terminalia exists in some males from Arizona and New Mexico, on which the cercus is less extended in a dorsal plane and the anterior process of the cercus is broader in lateral view. Such males, however, appear to match the species in other respects, including a yellow or yellowish brown propleuron and a diffuse basoventral process on the mid femur that bears six to eight setae.

Neoplasta scapularis (Loew)
(Figs. 7, 9, 12)

Hemerodromia scapularis Loew, 1862: 209.

Diagnosis. — Males are characterized by a unique combination of features, some of which individually can be found in males of other species. Each cercus is broadly triangular in lateral view and subequal in size to the corresponding epandrial lobe, the setae on the outer surface of each cercus are shorter than the anterior process, and the anterior process of each cercus is straight.

Description. — MALE. Body length including terminalia ca. 3.2–3.4 mm. Propleuron ranging from yellow to light brown to nearly black. Mid femur with basoventral swelling ranging from diffuse and bearing

row of 8–9 yellow bristles (Fig. 7) to prominent and bearing closely-set row of 4–5 stronger, yellow bristles, on some with an additional distal bristle off-set posterolaterally (see Fig. 6). Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (Fig. 12). Terminalia (Fig. 9) oriented in a vertical plane; cercus broadly triangular in an anterodorsal plane in lateral view, slightly larger than epandrial lobe; anterior process of cercus straight. FEMALE. Similar to male in size, coloration, and venation; indistinguishable from females of other species of the *N. scapularis* group.

Type material examined. — LECTOTYPE male, here designated from MCZ type series #1643, consisting of two males and three females, all in excellent condition. The two males possess the same data; upper label "Md" and lower label "Loew coll."; no other data present on labels. The male with a yellowish brown propleuron is designated LECTOTYPE and the second male with a brownish propleuron PARALECTOTYPE. Terminalia of neither male were dissected and macerated since the distinguishing features could be discerned. Three PARALECTOTYPE females: one with yellow propleuron with upper label "Me" and lower label "Loew coll."; two with brownish propleuron with upper label "Penn." and lower label "Loew coll." The lectotype and all paralectotypes are deposited in MCZ.

Other material examined. — 584 males, 570 females (see remarks section and Fig. 17). CANADA: Northwest Territories, Alberta, British Columbia, Ontario, Quebec, New Brunswick, Northwest Territories, and Nova Scotia. UNITED STATES: Alaska, Arizona, Arkansas, California, Colorado, Idaho, Indiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, Tennessee, Utah, Virginia, Washington, and Wisconsin.

Distribution. — Males are known through-

out the lower United States and southern Canada (Fig. 17).

Remarks.—The taxonomic status of *N. scapularis* requires more study. This taxon may represent a species complex, but we were unable to identify discrete phenotypes because intermediates connecting recognizable forms were encountered throughout its transcontinental distribution. For example, eastern specimens with a black propleuron usually possess a prominent basoventral swelling on the mid femur and an off-set distal bristle, but others with a black propleuron and identical terminalia have a diffuse basoventral swelling on the mid femur. And, while all west coast specimens possess a yellow propleuron, some have a mid femur identical to that of eastern specimens that possess a black propleuron and a prominent basoventral swelling with an off-set distal bristle. Unfortunately, few specimens exist from the central United States and Canada, but males from the Rocky Mountains are intermediate in propleural coloration, development of the mid femur and structure of the anterior process of the cercus, seemingly connecting their eastern and western counterparts.

More detailed discussion of character variation is warranted to support our taxonomic decision. Four forms of mid femur structure exist in males possessing nearly identical terminalia: 1) mid femur strongly arched basally, with prominent basoventral swelling bearing row of 4–5, closely-spaced bristles with an additional distal bristle off-set posterolaterally; 2) mid femur very strongly arched basally, with prominent swelling bearing row of 4–5, closely-spaced bristles, but lacking an off-set distal bristle; 3) mid femur slightly arched basally, with diffuse basoventral swelling bearing row of 8–9, weaker bristles, with two distal bristles slightly stronger and slightly off-set posterolaterally; and 4) mid femur strongly arched basally, with prominent basoventral swelling bearing row of 6–7, closely-spaced bristles with an additional distal bristle slightly

off-set posterolaterally. The first condition tends to be common on eastern specimens with a black propleuron and on specimens from Sequoia and Yosemite National Parks in California with a yellow propleuron. The second condition occurs on eastern specimens possessing a yellow propleuron. The third condition exists on specimens across the continent, including eastern specimens with propleural coloration ranging from yellow to nearly black. The fourth condition exists on specimens from the Rocky Mountains possessing a propleuron ranging in color from light brown to nearly black.

Overall, the propleuron was found to be yellow on 487 of 584 males (83%) and 499 of 570 females (88%) sampled over the geographical range of *N. scapularis*. Variation in propleural coloration was found to be greatest in specimens along the Appalachian Mountains and eastern seaboard, where the propleuron ranged from light brown to black on 61 of 155 males (39%) and 47 of 141 females (33%). The propleuron on 22 males from central Colorado and New Mexico ranged from yellowish brown in the north to brown in the south. A yellow propleuron occurred on all 407 males and 429 females from California north to Alaska.

Maceration of males revealed that specimens concurrently collected in Great Smoky Mountains National Park, the central Atlantic seaboard, New England, Ontario and Quebec possess nearly identical terminalia, but exhibit the range of propleural coloration from yellow to brown to black. Males with a yellow propleuron and a diffuse basoventral swelling on the mid femur differ slightly in the shape of the anterior process of the cercus, with eastern specimens and northern Rocky Mountain specimens possessing a narrower and more pointed anterior process than their west coast counterparts. Males from the west coast possess an anterior process of the cercus that is slightly expanded and more truncate apically than their eastern counterparts.

Based on the variation just described, we

treat *N. scapularis* as a widely distributed species that varies in propleural coloration, the structure of the mid femur, and the shape of the anterior process of the cercus. We found no evidence to support Melander's (1947) variety "*alleghani*" established on the basis of a black propleuron, and no evidence to support Melander's (1947) variety "*radialis*" based on a slight difference in wing venation.

Neoplasta scapularis is one of the most widely distributed hemerodromine species (Fig. 15) and the most frequently encountered *Neoplasta*, except in the central Rocky Mountains where *N. paramegorchis* and *N. hansonii* are more commonly collected. *Neoplasta scapularis* was shown to be associated with a variety of lotic habitats in Quebec, including large rivers and small streams (Harper 1980, Landry and Harper 1985). In the present study, specimens commonly were taken in our Malaise traps set up along or across streams in Indiana, Georgia, Great Smoky Mountains National Park, and the central Sierra Nevada mountains of California.

***Neoplasta scapuliformis* MacDonald & Turner, NEW SPECIES**
(Fig. 3)

Diagnosis.—The only known male of *N. scapuliformis* closely resembles males of *N. scapularis* that have a yellow propleuron. The terminalia are distinctive, however, with each cercus being broadly oval in a posterodorsal plane and bearing a weakly differentiated anterior process. This is in contrast to the well developed anterior process found on the cercus of males of all other species in the *N. scapularis* group, except *N. octoterga* (the males of which possess a distinctive eighth abdominal tergum).

Description.—**MALE.** Body length including terminalia ca. 3.0 mm. Propleuron yellow. Mid femur with diffuse basoventral swelling (see Fig. 7), bearing row of 6 yellow bristles. Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance be-

tween R_1 and R_4 (see Fig. 12). Terminalia (Fig. 3) oriented in a vertical plane; cercus broadly oval dorsally in lateral view, subequal in size to epandrial lobe; anterior process of cercus weakly differentiated from body of cercus. **FEMALE.** Similar to male in size, coloration, and venation; indistinguishable from females of other species of the *N. scapularis* group that have a yellow propleuron.

Type material.—**HOLOTYPE** male, top label: "ARIZONA Oak/Crk Cn Sedona/29 June 1953," bottom label "W W Wirth/Collector" (USNM). The specimen is in good condition, but the macerated terminalia, which are in a glycerin microvial attached to pin, are over-cleared and nearly unapparent in the microvial. The type locality is about 30 kilometers south of the city of Flagstaff. **ALLOTYPE**, same data as holotype (USNM).

Distribution.—The only known male is from northcentral Arizona (Fig. 18).

Etymology.—The specific epithet is an arbitrary combination of letters incorporating "formis," Latin for shape or figure, and "scapularis," alluding to the structural similarity between the new species and *N. scapularis*.

THE *N. CHRYSOPLEURA* SPECIES GROUP

This group includes one species in America north of Mexico, *N. chrysopleura* described below, but appears to include additional representatives in the Neotropical Region. This conclusion is based on preliminary examination of specimens of other species of *Neoplasta* from South America.

***Neoplasta chrysopleura* MacDonald & Turner, NEW SPECIES**
(Fig. 1)

Diagnosis.—Adult males and females are distinguished by the coloration of the thoracic pleura. In addition, males of *N. chrysopleura* have distinctive terminalia, described below, and different vestiture on the legs. For example, the fore femur bears a

complete row of large, bluntly pointed setulae ventrally in contrast to the single large setula within a row of much smaller setulae that exists on males of other species treated here.

Description.—**MALE.** Body length including terminalia ca. 3.5 mm. Propleuron, mesopleuron, metapleuron and ventral portion of laterotergite golden yellow; remainder of thorax black; legs yellow. Vein R_{2+3} gradually curving anteriorly, joining C from 0.3–0.5 distance between R_1 and R_4 (see Fig. 12). Fore femur ventrally bearing median row of 9–10 large, black setulae over basal $\frac{2}{3}$, with intermixed smaller black setulae forming 2 diverging rows over distal $\frac{1}{3}$. Mid femur strongly arched basally, with 4 golden bristles lining basoventral swelling on outer surface and 3 weaker bristles on inner surface. Mid tibia with distal patch of black setulae lining indentation for reception of basoventral swelling of mid femur, including 6 stronger setulae forming an outer row. Terminalia (Fig. 1) oriented in a horizontal plane; cercus pointed posteriorly in lateral view and strongly notched over distal $\frac{1}{2}$ in dorsal view; epandrial lobe nearly rectangular in lateral view, with distal fringe of long setae; hypandrium more or less rectangular in lateral view, with patch of prominent setae mid ventrally and large distal process projecting dorsally. **FEMALE.** Similar to male in size, coloration, and venation; lacking prominent vestiture of male mid leg.

Type material.—**HOLOTYPE** male, top label "USA: AL. Co./10 km E. Evergreen/23. IV. 1989/J.M. Cumming," bottom label "ex. along woodland/sandbottom stream" (CNC, holotype no. 21338). The specimen is in excellent condition and most of the diagnostic features of terminalia visible without maceration. **ALLOTYPE**, same data as holotype (CNC). **PARATYPES.** Alabama: 2 females, same data as holotype (CNC). South Carolina: 2 males (both partially damaged; one male with macerated

terminalia in glycerin microvial attached to pin), Anderson, 21. VII. 1957 (CNC).

Distribution.—This species is known only from the southeastern United States (Fig. 19).

Etymology.—The specific epithet is formed from the Greek "chryso," for gold, and "pleura," for side, in reference to the color of the thoracic pleura, all of which are golden yellow.

Remarks.—The type series, collected by J. M. Cumming (Biological Resources Division, Agriculture Canada, Ottawa), was taken while sweeping vegetation along the banks of a sand bottom stream that ran through a hardwood forest.

CONCLUDING REMARKS

Adults of species of *Neoplasta* reportedly prey upon black fly larvae (Peterson 1960) and caddisfly pupae (Knutson and Flint 1971), but no other prey records exist. Larvae and pupae have not been described, but they are thought to be aquatic (Steyskal and Knutson 1981), and data associated with the collection of adults support this contention. Adults of *Neoplasta scapularis* have been captured in emergence traps placed over streams in Quebec and were most abundant in association with areas of greatest current (Harper 1980, Landry and Harper 1985). During the present study, adults of *N. concava*, *N. deyrupe*, *N. paramegorchis* and *N. scapularis* were collected in Malaise traps set up either along or across small streams. Adults of *N. concava* and *N. paramegorchis* also were aspirated from leaves of trees along streams in southcentral Utah and southern Colorado; those of *N. scapularis* were collected in a similar manner in Indiana and Great Smoky Mountains National Park. These adults appear to be restricted to shaded foliage in such habitats, most commonly the undersides of leaves, and they typically are active only during mid- to late afternoon.

Awareness of possible sites of larval de-

velopment and knowledge of specific habitats in which adult activity occurs will be of value in ecological and biological research pertaining to this genus. Description of larvae could be of importance to phylogenetic studies of the Hemerodromiinae, especially since adults of *Neoplasta* differ from those of other genera in such features as fore leg structure and wing venation. The use of techniques presented by Cumming and Cooper (1992) involving decapitation of female adults to force oviposition and subsequent rearing of larvae in nutrient agar may be a means of obtaining larvae of *Neoplasta* for study, in the event their particular development site is not discovered and they cannot be collected.

The species of *Neoplasta* treated here appear to have diverged relatively recently, as suggested by their uniform morphology and often subtle differences in male terminalia. Also, we have noted what appears to be hybridization, in the form of recognizable intermediates between two different pairs of closely related species (see remarks under *Neoplasta concava* and *N. parahebes*). Answers to questions pertaining to the mechanisms of reproductive isolation among closely related species may be approachable now that we can pinpoint adult activity to a particular time and place, for example, mid-afternoon on the undersides of leaves overhanging small streams. Similarly, the taxonomic status of "*N. scapularis*" may be resolved if living specimens can be observed and collected so that the color and structural forms of adults can be studied in relation to geographical distribution, reproductive behavior, and molecular characters.

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